Associating Locality-level Characteristics with Surviving the Holocaust: A Multilevel Approach to Chance of Being Deported and to Risk of Death of Jews Living in Dutch Municipalities

ABSTRACT

Characteristics of the localities in which Jews lived haven't been given much attention in research on Holocaust-related deaths. This study examined associations between locality-level and individual-level characteristics with chance of being deported by applying multilevel mixed-effects logistic regression models on about 118,000 Jews in 102 Dutch municipalities listed in 1941-42 and linked to post-war victims and returnees lists. Next, it examined associations between individual-level characteristics and risk of death of deported Jews in multilevel mixed-effects Weibull regression models. Locality-level characteristics associated with higher deportation chance were: Higher proportion of collaborating policemen (OR=1.07, 95%CI=1.02-1.12), strong segregation mentality (OR=2.01, 95%CI=1.15-3.50), and lower percentage employed in agriculture (OR=0.95, 95%CI=0.88-1.01). Higher percentage of Catholics (OR=0.81, 95%CI=0.70-0.94) and stronger electoral support for the National Socialist Movement (OR=0.90, 95%CI=0.85-0.97) unexpectedly reduced deportation chance. Individual-level characteristics which reduced deportation chance were: females, aged 0-5 or 15-30, immigrants, intermarried, and converts to Christianity. Deported males aged 15-30 had reduced risk of death between July 1942 and July 1943 but increased risk thereafter. This result is consistent with young adult men being selected for work after deportation, but this selection not offering protection. The significant impact of both locality-level and individual-level characteristics suggest that Holocaust survival wasn't random.

KEYWORDS: Holocaust, persecution, violence, mortality, Jews, the Netherlands, multilevel design

BACKGROUND

A growing body of epidemiological research relates local circumstances with differences in mortality, morbidity, suicide, homicide, and deaths caused by law-enforcement officials.(1-5) Locality-level characteristics aren't given much attention in research on genocide and Holocaust-related deaths.(6) This study aims to examine the association of Locality-level characteristics with deportation to Nazi-camps for Jews living in the Netherlands during WWII.

The *American Jewish Yearbook 1948-1949* published estimated losses suffered by Jews in 14 countries.(7) The proportion of losses for the Netherlands was the highest in Western Europe. Fein compared 22 states and regions occupied by Nazi-Germany in an ecological study, associating survival rates with anti-Semitism and *Schutzstaffel* (*SS*)-grip. In her study, the Netherlands deviated from the expected ranking as the survival rate was relatively low, while anti-Semitism was also low and the direct *SS*-grip not strong.(8) Despite some contradictions, Fein's study shifted the research agenda from 'who' had persecuted Jews to 'circumstances' under which Jews were persecuted.

Investigating associations between national-level characteristics and survival rates is statistically restricted because the countries Nazi-Germany occupied offer a limited number of cases.(6, 9) As Presser(10) had hinted at differences in local survival rates within the Netherlands, Flap and Ultee(9) proposed to compare municipalities. Using multilevel modelling, Croes and Tammes investigated the impact of municipality characteristics on survival chances of nearly 37,000 Jews in 47 municipalities and found survival chances

inversely related with the proportion of collaborating policemen and positively related with the percentage of Catholics and the proportion of Jewish converts to Christianity.(11) An ecological study by Tammes and Smits found a positive relation between survival rates and level of agriculture.(12) This result was also found by Tammes and Ultee in a weighted multivariable logistic regression; their study showed, furthermore, an inverse relation of population density and ambiguous relationships of religiously homogeneous marriages among non-Jews with survival chances.(13) Braun's study found a positive association between local religious minority networks and Jews' evasion of deportation using autologistic regression.(14)

This research builds on these studies by expanding and joining information on perpetrators, bystanders, and victims at the municipality-level. At the individual-level, it includes characteristics associated with better survival chances such as intermarriage, conversion to Christianity, and immigration.(15, 16) By combining locality-level and individual-level data, this study avoids ecological and atomistic fallacies. In addition, by matching the database against post-war victims' lists, it used information on dates of death of Jews who died in Nazi-camps and of those who died of natural causes or committed suicide, allowing better decisions on who to include in analyses. Besides, by matching the database against returnees allows to determine who were deported. Locality-level characteristics might have had more impact on deportation chance as most Jews were deported from their local area than on risk of death in Nazi-camps. After being deported, socio-demographic background characteristics might have had more impact on the risk of death. By linking different datasets, this study makes progress by investigating the impact of Locality-level and individual-level characteristics on (1) chance of deportation and (2) risk of death of deported Jews.

MODEL

To better understand the circumstances under which Jews were persecuted, Hilberg introduced the Perpetrator-Bystander-Victim constellation.(17) Ehrenreich and Cole improved this constellation by exploring interrelations between these groups and introducing dynamic spectra of involvement, agreement, and opposition vis-à-vis the Nazi-persecution of Jews (Figure 1).(18) The level of participation in the destruction process is plotted along the perpetrator-side. The area closest to the lower right vertex is the apex of involvement and shows those with the authority and control necessary to instigate and implement the destruction process. In this study, they are the Nazi-occupiers such as the *Sicherheitspolizei* [Security Police] (*SiPo*). They set the criteria on who belonged to the victim group, decided when and where for example to hold round-ups or begin deportations and used their power and authority to manipulate bystanders' involvement, shown by arrow 1. The area closest to the top vertex encompasses non-perpetrators actively involved. In this study, they are burgomasters who were members of the *Nationaal Socialistische Beweging* [National Socialist Movement] (NSB)(19, 20) and collaborating local policemen. This study tests the hypotheses: Jews living in municipalities (1a) where an NSB-burgomaster was appointed or (1b) where relatively more policemen collaborated had increased chances of being deported.

The top vertex is a transitional point as it joins the bystander- and perpetrator-side. Bystanders comprise those who didn't participate in the destruction process and didn't belong to the victim group. The triangle's top left side signifies those who weren't willing to participate but supported or facilitated the Nazi-persecution of Jews such as the isolation of

Jews. In this study, bystanders who might have supported or facilitated the Nazi-persecution of Jews were NSB-voters(21, 22) and Catholics as, among them, anti-Jewish sentiments were most prominent.(23) Pre-WWII Netherlands was divided along denominational lines (vertical pluralism), resulting in a strong sense of living segregated.(24) In municipalities with stronger sense of living segregated, isolation of Jews might had been more accepted.(25) This study tests the hypotheses: Jews living in municipalities (2a) where NSB got relative more votes, (2b) where relative more Catholics lived or (2c) with a strong sense of living segregated had increased chances of being deported.

The triangle's lower left side shows those who opposed the destruction process. In this study, they are those who resisted the Nazi-occupation and those who supported Jews in hiding or escaping. Bystanders might change their position (i.e., moving from facilitation to resistance) depending on policies implemented and actions taken by the Nazi-occupiers. Upon their turn, bystanders might influence Nazi-occupiers, shown by arrow 2. Resistance networks could support Jews in hiding while persons born from Jewish-Gentile intermarriages could be bridges between Jewish and non-Jewish communities and thereby more willing and able to support hiding. Following-up on Braun's conclusion(14), religious fragmented municipalities were more willing to assist Jews to escape persecution. This study tests the hypotheses: Jews living in municipalities (3a) with weak resistance, (3b) with relative lower number of so-called 'half' or 'quarter' Jews, or (3c) less religiously fragmented had increased chances of being deported.

As the victim group was classified by the Nazis, it was impossible for a member of this group to traverse to any of the other sides. Victims on the left-hand of the victim-side were in a better position to escape persecution, such as children younger than 6 who didn't had to

wear the yellow star of David or children younger than 15 who didn't need a J-stamped identity-card.(26) The Nazi-occupiers had exempted from deportation all intermarried Jews and Jewish converts to Christianity.(10, 26) The Jewish Council, established by order of the Nazi-occupiers, could exempt their employees and relatives temporarily from deportation. Within this council migrants, particularly German refugees, were overrepresented, and this group might had received more exemptions.(27) In addition, they held advantageous positions in Westerbork transit camp, enabling them and their relatives to avoid or postpone further deportation.(27) This study tests the hypotheses: Jews who were (4a) younger than 15, (4b) intermarried, (4c) converted to Christianity, or (4d) immigrants had decreased chances of being deported.

This study considers the context within which perpetrators, bystanders, and victims operate, and is an adjustment to the Perpetrator-Bystander-Victim constellation (Figure 1). Qualitative or impression-based evidence suggested that many were hiding on farms.(28) It has also been suggested that hiding was more difficult in municipalities with higher population density.(27) Besides, a Jew's potential to receive help might have been higher in municipalities with a relative lower number of Jewish inhabitants. This study tests the hypotheses: Jews living in municipalities (5a) with less farms, (5b) higher population density, or (5c) higher proportion of Jews had increased chances of being deported.

Figure_1_here

The killing of Jews was the last stage within the destruction process.(29) Again, some groups were in a better position to survive Nazi-camps after being deported. Deported men were more likely to be selected for labour in Nazi-camps than women(10); especially men aged 16-60 and women aged 16-30.(26) The Dutch Red Cross [Nederlandsche Roode Kruis (NRK)]

concluded that relatively more women had returned from Auschwitz, and that nearly all Jews younger than 16 and older than 50 had perished in Auschwitz.(30) One might assume that the age group 16-50 was also physically strongest to survive other Nazi-camps. Furthermore, impression-based evidence suggests that Dutch Jews suffered more in Nazi-camps than Jews with another nationality.(10) Although converts to Christianity and intermarried Jews were exempted from deportation, many were deported, for example, when caught after violating anti-Jewish regulations. As there is little known about their position in Nazi-camps no hypothesis about their risk of death is formulated. This study tests the hypotheses: (6a) Jewish immigrants, (6b) men aged 15-30, and (6c) women aged 15-30 had a reduced risk of death.

METHODS

Study design and setting

This study used a multilevel design whereby individuals were level-1 units and municipalities were level-2 units. Retrieved registration lists were used if they were made before local deportations started and contained 25 or more Jews, totalling 126 municipalities with over 122,000 Jews in the study's database (Appendix 1). Excluded were 345 persons registered double on the same list, 318 persons registered on more than one list, and 344 persons with an incomplete name or date of birth as these characteristics were needed to match with the victimization lists.

As the study focused on Locality-level characteristics during the period of risk, 19 municipalities (1,679 Jews) were excluded as most of their Jewish inhabitants were ordered

to move to Amsterdam before regular deportations started. After linking municipal characteristics from other sources to the constructed individual-level database, another 5 municipalities (657 Jews) were excluded as they had missing data on Locality-level characteristics, enabling complete case analyses. This resulted in 119,082 Jews living in 102 municipalities to be used in this study; 85% of all Jews and 61% of all municipalities having 25 or more Jewish inhabitants. Supplementary Table 2 shows local deportation and victimization rates.

Outcome measures

To determine who was killed, where, and when, Jews were linked to victimization lists, such as *In Memoriam-Lezecher*,(31) Dutch Digital Monument, Jews who died in the Dutch camps Westerbork and Vught, and those who perished outside Nazi-camps, resulting in 84,953 Jewish victims (Supplementary Table 1). Matching Jews who returned from Nazi-camps against the ones who weren't matched with the victimization lists resulted in 3,180 liberated in Nazi-camps and thus had been deported (Appendices 1 and 2). Using this information, this study had two outcomes (Appendix 3).

1-Chance of being deported to transit, concentration, or extermination camp. Within the Netherlands, nearly all Jews were first deported to Westerbork transit camp and then, from there, to concentration and killing camps abroad. This study measured being deported by being killed in Nazi-camps or having returned from them.(14)

2-Risk of death of deported Jews. The monthly observation period ran from July 1942, start of regular deportations, till May 1945, end of WWIII. Deported Jews were followed till they were killed, committed suicide in a Nazi-camp, or till May 1945 if they survived.

Excluded from analyses were 683 Jews who died of natural causes before July 1942 and respectively 54 and 103 Jews whose gender or place of birth was unknown, leaving 118,242 Jews included in analyses on being deported; we didn't exclude those who died of natural causes after June 1942 as they ran the risk to be deported. Among them 87,679 were deported to Nazi-camps. To reduce immortality-time bias(32) in the analysis on risk of death among deported Jews, also excluded were those deported and/or killed by Nazis before July 1942 as many weren't in danger to be deported before that time; in total 926 Jews. Furthermore, excluded were 160 Jews whose status was 'missing' (no date of death given) and 301 Jews for whom only year of death was known, resulting in 86,292 Jews in the analysis on risk of death. Among them 83,112 were killed in Nazi-camps.

Individual characteristics

Characteristics at the individual-level are: gender, age categorized into 0-5, 6-14, 15-30, 31-60, and 61+, migrant status, converted to Christianity, and intermarried.

Locality-level characteristics

Perpetrators.

The Nazi-occupiers divided the Netherlands into seven *SiPo*-districts: The Hague, Rotterdam (South Holland province without The Hague), Amsterdam (North Holland and Utrecht provinces), Groningen (Drenthe, Friesland, and Groningen provinces), Arnhem (Gelderland and Overijssel provinces), Den Bosch (North Brabant and Zeeland provinces), and Maastricht (Limburg province). For each municipality, the shortest distance in kilometres as the crow flies to the nearest *SiPo*-office within the district was taken. In 15 municipalities round-ups

had taken place before regular deportations started. In some municipalities, such as in Amsterdam, the regular deportations started in July 1942; in many others, deportations started later. Local deportations starting between January and April 1943 were combined into one category as separate months showed low numbers.

Involvement of non-perpetrators.

In 24 municipalities, an NSB-burgomaster was appointed before July 1942. In 35, one was appointed after June 1942. And in 43, such a burgomaster was never appointed. For each municipality, the number of lower ranking policemen fired after the liberation because of their attitude and conduct during the occupation was determined, allowing to calculate proportions of collaborating policemen in local police forces.

Bystanders facilitating Nazi-persecution of Jews.

For each municipality, the pre-WWII percentage of Catholics and electoral support for the NSB was determined. Local segregation mentality was measured by the degree of non-Jews in religiously homogeneous marriages using Cohen's kappa(33); a higher score would suggest stronger segregation mentality.

Bystanders resisting Nazi-persecution of Jews.

This study determined the degree of religious fragmentation following Rae and Taylor; a higher fragmentation score would show a more religiously diverse municipality.(34) Persons born from Jewish-Gentile intermarriages could be bridges between Jewish and non-Jewish communities. For each municipality, the proportion of so-called 'half' and 'quarter' Jews was calculated. The degree of local resistance was measured by the number of printed

resistance newspapers. The municipalities were categorized into none, less than three, and three or more resistance newspapers printed per 10,000 population.

Context.

This study included the percentage of the population occupied in agriculture, population density in square kilometres, and the number of Jewish inhabitants per 1,000 adult non-Jews.

Appendix 4 provides more information on these variables.

Statistical methods

Multilevel mixed-effects logistic regression was applied to obtain odds ratios for chance of being deported in relation to individual-level and Locality-level characteristics. To make sure difference in activities between *SiPo*-districts wasn't driving the results, fixed effects for *SiPo*-districts were included. Continuous measured variables were rescaled to have a mean of zero and a standard deviation of one, while constructed variables were divided into groups.

The multilevel mixed-effects Weibull regression model was applied to obtain hazard ratios for risk of death of deported Jews. In such a model greater weight is given to deaths that occurred earlier in the period versus deaths that occurred later. Due to fluctuating weekly number of deportation trains leaving for different Nazi-camps between July 1942 and September 1944, mortality rates differ over time (Figure 2). To account for non-proportional hazards, follow-up time was split into three periods to estimate hazard ratios separately: July 1942-January 1943, February-July 1943, and August 1943-May 1945.

Since in the Netherlands a small majority of Jews lived in Amsterdam, sensitivity analyses ran the models without Amsterdam. All analyses were undertaken in Stata 15MP.

Figure_2_here

RESULTS

Chance of being deported (Table 1)

The intercept of this model showed a deportation chance of 77.4%. Females, age group 0-5, immigrants, converts to Christianity, and intermarried Jews showed a decreased odds ratio, while age groups 6-14, 31-60 and 61+ showed an increased odds ratio. The model showed some weak evidence that local deportations starting after September 1942 decreased odds ratios while local round-ups before July 1942 increased odds ratios. Higher odds ratios were associated with higher proportion of local collaborating policemen (OR=1.07, 95%CI=1.02-1.12) and the highest degree of non-Jews in religiously homogeneous marriages (OR=2.01, 95%CI=1.15-3.50); higher percentage employed in agriculture showed some weak evidence of increased odds ratios (OR=0.95, 95%CI=0.88-1.01). The percentage of local NSB-votes showed a non-linear relation: a higher percentage of NSB-votes decreased the odds ratio (OR=0.90, 95%CI=0.85-0.97), but this association tailed off as the percentage of NSB-votes increased (OR=1.03, 95%CI=1.01-1.06). The percentage of Catholics also showed a non-linear relation: a higher percentage of Catholics decreased the odds ratio (OR=0.81, 95%CI=0.70-0.94), but this association tailed off as the percentage of Catholics increased (OR=1.06, 95%CI=1.02-1.11). The model without Amsterdam showed a slightly lower deportation chance (76.7%) but similar associations.

Table_1_here

Risk of death (Table 2)

In the first two periods, females had an increased risk of death compared with males but a decreased risk in the last period. All age groups had an increased risk of death in the first and second period but a decreased risk in the third period compared with Jews aged 15-30. An interaction between gender and age groups, not shown in Table 2 but illustrated in Figure 3, showed that between July 1942 and January 1943 the biggest difference in risk of death was between males and females in the age group 15-30. Between February and July 1943, males aged 15-30 had still a reduced risk of death compared to other age groups in both sexes, though the gap between males and females aged 15-30 narrowed. After July 1943, however, males aged 15-30 had worst risk of death. Immigrants, Jewish converts to Christianity, and intermarried Jews had a decreased risk of death in all three periods. Local deportations starting after October 1942 showed a decreased risk of death among deported Jews. The model without Amsterdam showed similar results.

Table_2_here

Figure_3_here

DISCUSSION

Dutch historians believe that practically all Jews complied with the Nazi-order to register.(10, 26) Registration lists were produced by all burgomasters and checked for their accuracy.(35) Although not all lists were retrieved, this didn't result in a (geographical) selection bias (Appendix 1). Using different post-war victimization lists reduced misclassification bias (Appendix 1). Deterministic linkages matched registered Jews with

Jews on victimization lists (Appendix 2). Although non-matched Jews weren't linked to post-war population registers to validate their survival, linkages to different victimization lists provided the most accurate victimization rates, allowing the testing of hypotheses.

The hypothesis concerning non-perpetrators actively involved in the destruction process was supported by the results for the proportion of collaborating policemen, though not by the appointment of NSB-burgomasters. This might suggest that lower, rather than higher, level of collaboration had more impact on deportation.(36)

The hypothesis concerning bystanders facilitating the Nazi-persecution of Jews was rejected by the results for percentages of NSB-votes and Catholics. The interrelationships between perpetrators and bystanders, as shown by arrows 1 and 2 in Figure 1, might clarify the unexpected association for Catholics. In August 1942, a couple of hundred Jewish converts to Catholicism were transported to Westerbork as a response to church protests against the deportation of Jews.(37) As a result, this Nazi-sanction might have strengthened Catholics' resistance to the Nazi-persecution of Jews. The inverse relation between NSB-votes and deportation chance doesn't suggest that NSB-oriented bystanders helped Jews but could show that Jews were more alert in a hostile environment. However, given this counterintuitive result, NSB-votes might rather be another measure of local segregation as research showed that higher percentage of NSB-votes was associated with lower degree of segregation.(38) Furthermore, municipalities with the highest degree of segregation mentality increased deportation chance, supporting this hypothesis.

The hypothesis concerning bystanders resisting Nazi-persecution wasn't supported by the results for relative number of resistance newspapers, local religious fragmentation, and the proportion of 'half' and 'quarter' Jews. These 'half' and 'quarter' Jews might rather

connected Jewish and non-Jewish families than acted as bridges between communities. Besides, their intermarried family-members were exempted from deportation. Although local religious minority groups might have saved Jews, the size of these minority groups might have been too small to make a significant impact. While some resistance groups focused on helping Jews many other groups had other priorities.

The hypothesis concerning the victim group was supported by the results for intermarried Jews, Jewish converts to Christianity, and immigrants. Besides, the results for children aged 0-5 supported this hypothesis, but the results for children aged 6-14 rejected it. This might signify the increased risk when marked with the yellow Star of David. In addition, better survival for the youngest children might also be attributed to easier ways of hiding them.(39)

The hypothesis concerning the context within which perpetrators, bystanders, and victims operate wasn't supported by the results for the relative number of Jews per 1,000 adult non-Jews and population density. There is some weak evidence that a higher percentage of the local workforce employed in agriculture decreased deportation chance, supporting this hypothesis.

The hypothesis concerning risk of death was supported by the result for immigrants. Results for males aged 15-30 for the first two periods and for females aged 15-30 for the second period supported the hypothesis. These results suggest that especially young adult men were selected for work after deportation, but these selections weren't protective.

Conclusion

The wide variation in local deportation and survival rates within the Netherlands indicates that also other factors than the Nazi-occupiers were of importance. Using the Perpetrator-Bystander-Victim constellation, this study formulated and tested hypotheses on locality-level and individual-level characteristics. The Nazi-occupiers influenced deportation chance by exempting victim groups from deportation or anti-Jewish regulations. Nearly all exempted groups such as aged 0-5, intermarried and converts to Christianity had reduced deportation chances. Early round-ups and early start of local deportation increased chances of being deportation. Within the process of persecution of Jews, the Nazi-occupiers relied on collaboration of local policemen. Besides, local factors such as a high degree of segregation mentality, indicating acceptance of isolating Jews, facilitated the deportation of Jews. Other factors such as higher percentage of Catholics, indicating stronger rejection of Nazi-persecution of Jews, and higher percentage of the workforce employed in agriculture, indicating more or better hiding opportunities, offered Jews some protection against deportation. Furthermore, this study showed the importance of individual-level characteristics such as age and gender on surviving Nazi-camps after deportation.

This study found an unexpected positive association between percentage of Catholics and deportation chance; replicating results in previous work.(12) Taking into account the two arrows between the Nazi-occupiers and bystanders in the Perpetrator-Bystander-Victim constellation (Figure 1), enabled interpreting this result. This study improved this constellation by including local context such as the percentage of the workforce employed in agriculture, which was inversely associated with deportation chance.

The significant impact of both locality-level and individual-level characteristics suggest that Holocaust survival wasn't random. Future studies could make progress by adding other

information such as marital status and occupation and information on in-between events and positions such as temporarily exempted from deportation, sent to Dutch labour camp, in hiding, and the date of arrival in Westerbork transit camp and that of deportation to Nazi-camps abroad. Most of this information can be found on Jewish Council index-cards allowing to apply a life-course approach on surviving the Holocaust.(40) Epidemiology might guide such research through study design.

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Table 1. Adjusted Odds Ratios and 95% Confidence Intervals for Individual-level and Locality-level Characteristics and Chance of Deportation among Jews in the Netherlands 1941-2.

	M1: 102 Municipalities, 118,242 Jews				M2: without Amsterdam, 42,112 Jews			
INDIVIDUAL LEVEL	OR	95% CI	*P* val.	% Dep.	OR	95% CI	*P* val.	% Dep.
Gender (ref.=male)								
Female	0.92	0.89, 0.94	<0.001	75.9	0.81	0.78, 0.85	<0.001	72.8
Age (ref.=15-30)								
0-5	0.77	0.72, 0.82	<0.001	72.6	0.81	0.73, 0.90	<0.001	72.8
6-14	1.30	1.24, 1.37	<0.001	81.7	1.27	1.17, 1.39	<0.001	80.7
31-60	1.38	1.34, 1.43	<0.001	82.6	1.29	1.22, 1.37	<0.001	81.0
>60	1.79	1.71, 1.88	<0.001	86.0	1.60	1.49, 1.73	<0.001	84.1
Migrant (ref.=born in Netherlands)								
Born abroad	0.64	0.62, 0.66	<0.001	68.7	0.78	0.74, 0.83	<0.001	72.1
Converted to Christianity (ref.=no)								
Yes	0.31	0.27, 0.35	<0.001	51.8	0.36	0.31, 0.43	<0.001	54.5
Intermarried (ref.= no)								
Yes	0.16	0.15, 0.17	<0.001	35.5	0.10	0.09, 0.11	<0.001	24.1
MUNICIPAL LEVEL								
SiPo-district (ref.=Amsterdam district)								
The Hague	1.06	0.56, 1.99	0.87		1.05	0.55, 2.00	0.89	
Rotterdam	1.00	0.63, 1.58	0.99		1.04	0.65, 1.64	0.88	
Arnhem	0.86	0.54, 1.37	0.53		0.88	0.54, 1.41	0.58	
Groningen	1.53	0.91, 2.57	0.11		1.56	0.92, 2.63	0.10	
Den Bosch	0.28	0.12, 0.64	<0.01	49.2	0.28	0.13, 0.65	0.03	48.4
Maastricht	0.96	0.40, 2.31	0.92		0.96	0.40, 2.34	0.93	
Distance in km to *SiPo* office (std. mean)	0.95	0.85, 1.06	0.34		0.97	0.90, 1.04	0.34	
Round ups before July 1942 (ref.=no)								
Yes	1.44	1.00, 2.08	0.06	83.2	1.43	0.99, 2.07	0.06	82.8
Start regular deportations (ref.= July 42)								
August 1942	0.58	0.30, 1.11	0.10		0.55	0.28, 1.07	0.08	64.7
September 1942	0.81	0.42, 1.54	0.51		0.75	0.38, 1.48	0.41	
October 1942	0.51	0.26, 1.02	0.06	56.1	0.49	0.24, 0.98	0.05	62.1
November 1942	0.29	0.10, 0.84	0.02	50.3	0.30	0.11, 0.88	0.03	50.6
January-April 1943	0.50	0.24, 1.03	0.06	63.0	0.47	0.22, 0.99	0.05	61.2
NSB Burgomaster appointed (ref.= < 7/42)								
NSB Burgomaster appointed > 6/1942	1.08	0.79, 1.47	0.63		1.12	0.81, 1.55	0.49	
No NSB burgomaster appointed	0.96	0.72, 1.30	0.81		0.98	0.73, 1.33	0.92	
Prop. policemen collaborated (std. mean)	1.07	1.02, 1.12	0.01	78.6	1.12	1.03, 1.22	<0.01	78.7
% local NSB-votes in 1939 (std. mean)	0.90	0.85, 0.97	<0.01	76.2	0.81	0.71, 0.91	<0.01	73.9
% local NSB-votes – quadratic term	1.03	1.01, 1.06	<0.01		1.07	1.02, 1.12	<0.01	
% of Catholics (std. mean)	0.81	0.70, 0.94	<0.01	74.6	0.77	0.64, 0.94	0.01	75.0
% of Catholics – quadratic term	1.06	1.02, 1.11	<0.01		1.18	1.06, 1.31	<0.01	
Homogeneous religiously marrying:								
Cohen's kappa, (ref.= Q1: (<0.823))								
Q2 (>0.822-<0.882)	0.85	0.57, 1.26	0.43		0.89	0.59, 1.33	0.57	
Q3 (>0.881-<0.917)	1.02	0.64, 1.63	0.93		1.10	0.67, 1.80	0.71	
Q4: highest values (>0.916)	2.01	1.15, 3.50	0.01	87.3	2.13	1.21, 3.79	<0.01	87.6
% 'quarter+half' of 'full' Jews (std.mean)	1.00	0.94, 1.05	0.93		1.00	0.94, 1.07	0.92	
No resistance papers published (ref.)								
<3 papers per 10,000 adult population	0.99	0.68, 1.42	0.95		0.96	0.69, 1.34	0.83	
3+ papers per 10,000 adult population	0.88	0.63, 1.23	0.46		0.86	0.61, 1.21	0.38	
Religious fragmentation: (ref.= Q1 <0.453)								
Q2 (>0.453-<0.617)	0.83	0.49, 1.39	0.48		0.82	0.49, 1.39	0.47	
Q3(>0.616-<0.706)	1.09	0.58, 2.04	0.79		1.09	0.58, 2.05	0.39	
Q4: most fragmented (>0.705)	0.85	0.44, 1.64	0.63		0.84	0.43, 1.64	0.62	
Jews per 1,000 adult non-Jews (std.mean)	1.11	0.67, 1.83	0.68		1.08	0.92, 1.26	0.36	
% employed in agriculture (std. mean)	0.95	0.88, 1.01	0.07	76.4	0.91	0.82, 1.01	0.08	75.0
density: 100 inhabitants/km2 (std. mean)	1.08	0.91, 1.29	0.39		1.20	0.89, 1.62	0.23	
_cons	3.43	1.36, 8.64	<0.01	77.4	3.29	126, 8.60	0.02	76.7
RANDOM EFFECTS PARAMETERS								
Var(_cons)	0.19	0.12, 0.28			0.19	0.13, 0.29		

Abbreviations: OR=odds ratio, CI=confidence interval, *P* val.=*P* value, Dep.=chance of being deported, ref.=reference category, ref.=reference category, Q=quartile.
Note: Estimated odds ratios from multilevel mixed-effects logistic regression analyses.

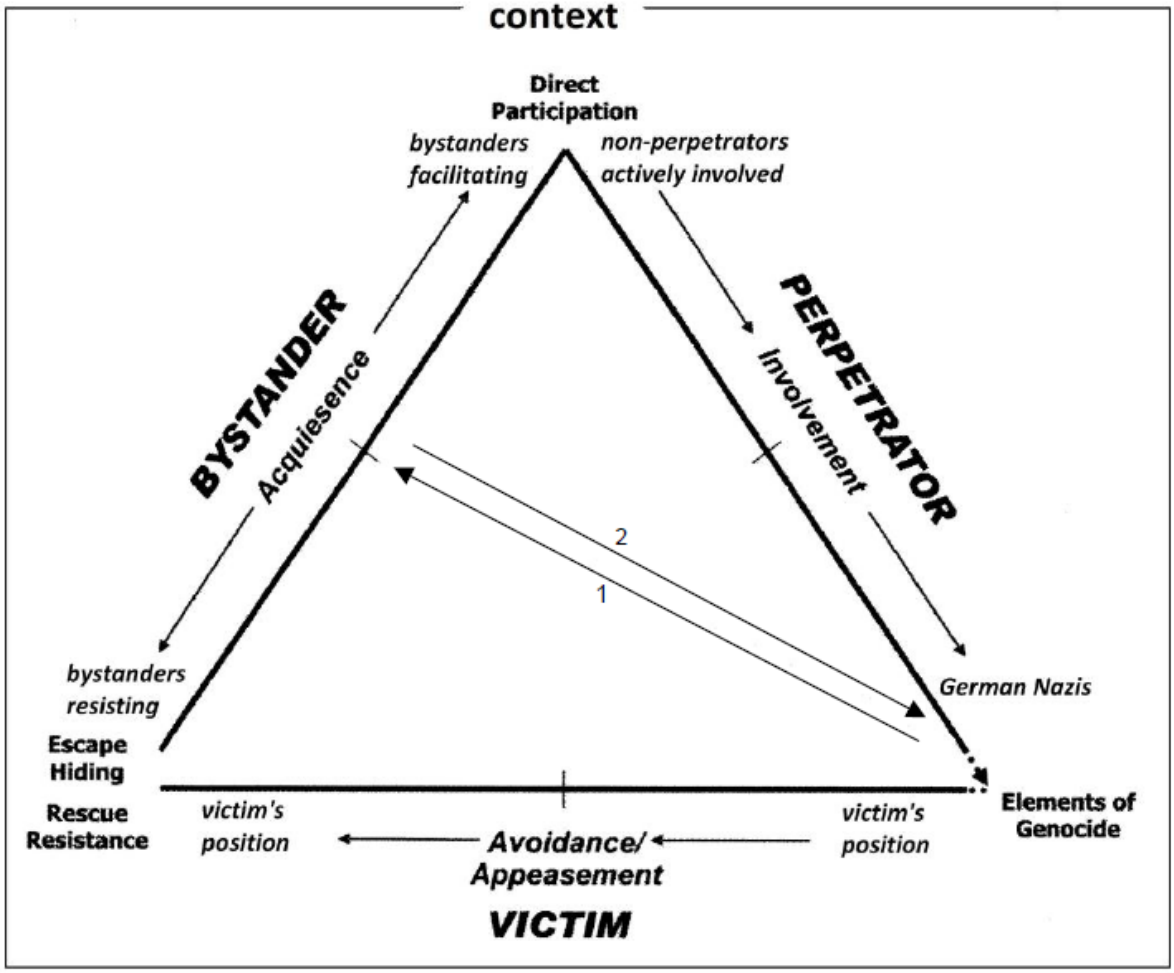
Table 2. Adjusted Hazard Ratios and 95% Confidence Intervals for Individual-level and Local Perpetrator Characteristics and Risk of Death among Jews in the Netherlands Deported to Nazi-camps, Follow-up Time Splitted into Three Periods: July 1942 - January 1943 (p1), February 1943 – July 1943 (p2), and August 1943 – May 1945 (p3).

	M1: 102 Municipalities, 86,292 Jews			M2: without Amsterdam, 28,937 Jews		
INDIVIDUAL LEVEL	HR	95% CI	*P* val.	HR	95% CI	*P* val.
Gender (ref.=male)						
Female_p1	1.41	1.38, 1.44	<0.001	1.60	1.54, 1.66	<0.001
Female_p2	1.21	1.19, 1.24	<0.001	1.25	1.21, 1.30	<0.001
Female_p3	0.82	0.80, 0.85	<0.001	0.67	0.64, 0.71	<0.001
Age (ref.=15-30)						
0-5_p1	1.46	1.38, 1.54	<0.001	1.78	1.64, 1.94	<0.001
0_5_p2	1.51	1.44, 1.59	<0.001	1.50	1.37, 1.64	<0.001
0-5_p3	0.53	0.48, 0.58	<0.001	0.53	0.45, 0.62	<0.001
6-14_p1	1.39	1.33, 1.44	0.001	1.87	1.76, 2.00	<0.001
6-14_p2	1.63	1.57, 1.69	<0.001	1.59	1.49, 1.71	<0.001
6-14_p3	0.57	0.53, 0.61	<0.001	0.53	0.48, 0.60	<0.001
31-60_p1	1.19	1.16, 1.22	<0.001	1.55	1.48, 1.62	<0.001
31-60_p2	1.45	1.42, 1.48	<0.001	1.46	1.40, 1.53	<0.001
31-60_p3	0.74	0.72, 0.76	<0.001	0.69	0.66, 0.73	<0.001
>60_p1	1.13	1.09, 1.17	<0.001	1.34	1.26, 1.42	<0.001
>60_p2	2.75	2.67, 2.83	<0.001	2.91	2.76, 3.06	<0.001
>60_p3	0.91	0.86, 0.97	<0.01	0.93	0.84, 1.03	0.162
Migrant (ref.=born in Netherlands)						
Born abroad_p1	0.72	0.70, 0.75	<0.001	0.76	0.71, 0.80	<0.001
Born abroad_p2	0.70	0.68, 0.72	<0.001	0.86	0.82, 0.91	<0.001
Born abroad_p3	0.72	0.69, 0.74	<0.001	0.80	0.75, 0.85	<0.001
Converted to Christianity (ref.=no)						
Converted_p1	0.73	0.60, 0.89	<0.01	0.60	0.46, 0.77	<0.001
Converted_p2	0.36	0.30, 0.44	<0.001	0.32	0.25, 0.42	<0.001
Converted_p3	0.40	0.33, 0.48	<0.001	0.45	0.35, 0.56	<0.001
Intermarried (ref.= no)						
Intermarried_p1	0.88	0.82, 0.94	<0.001	0.71	0.59, 0.84	<0.001
Intermarried_p2	0.69	0.65, 0.73	<0.001	0.23	0.18, 0.30	<0.001
Intermarried_p3	0.59	0.55, 0.63	<0.001	0.34	0.29, 0.41	<0.001
MUNICIPAL LEVEL						
SiPo-district (ref.=Amsterdam district)						
The Hague	1.21	0.90, 1.62	0.202	1.29	0.98, 1.69	0.072
Rotterdam	1.49	1.22, 1.82	<0.001	1.53	1.27, 1.87	<0.001
Arnhem	1.25	1.04, 1.51	0.017	1.30	1.08, 1.55	<0.01
Groningen	1.96	1.65, 2.32	<0.001	2.00	1.69, 2.37	<0.001
Den Bosch	0.67	0.53, 0.85	<0.01	0.72	0.58, 0.91	<0.01
Maastricht	1.03	0.82, 1.29	0.807	1.03	0.83, 1.28	0.799
Distance in km to *SiPo* office (std. mean)	0.99	0.97, 1.03	0.971	1.00	0.95, 1.04	0.846
Round ups before July 1942 (ref.=no)						
Yes	1.04	0.89, 1.21	0.616	1.01	0.87, 1.17	0.945
Start regular deportations (ref.= July 42)						
August 1942	0.93	0.72, 1.19	0.571	1.00	0.76, 1.31	0.997
September 1942	0.96	0.74, 1.25	0.752	1.02	0.77, 1.36	0.877
October 1942	0.96	0.74, 1.26	0.782	1.03	0.78, 1.37	0.843
November 1942	0.50	0.31, 0.82	<0.01	0.55	0.34, 0.89	0.014
January-April 1943	0.66	0.49, 0.89	<0.01	0.71	0.52, 0.97	0.031
_cons	0.01	0.01, 0,01	<0.001	0.01	0.01, 0.01	<0.001
Random components of variance						
Individual level intercept: /ln_p	0.47	0.46, 0.48		0.50	0.49, 0.51	
Municipality level intercept: var(_cons)	0.05	0.03, 0.07		0.04	0.03, 0.06	

Abbreviations: HR=Hazard ratio, CI=confidence interval, *P* val.=*P* value, ref.=reference category, Q=quartile.

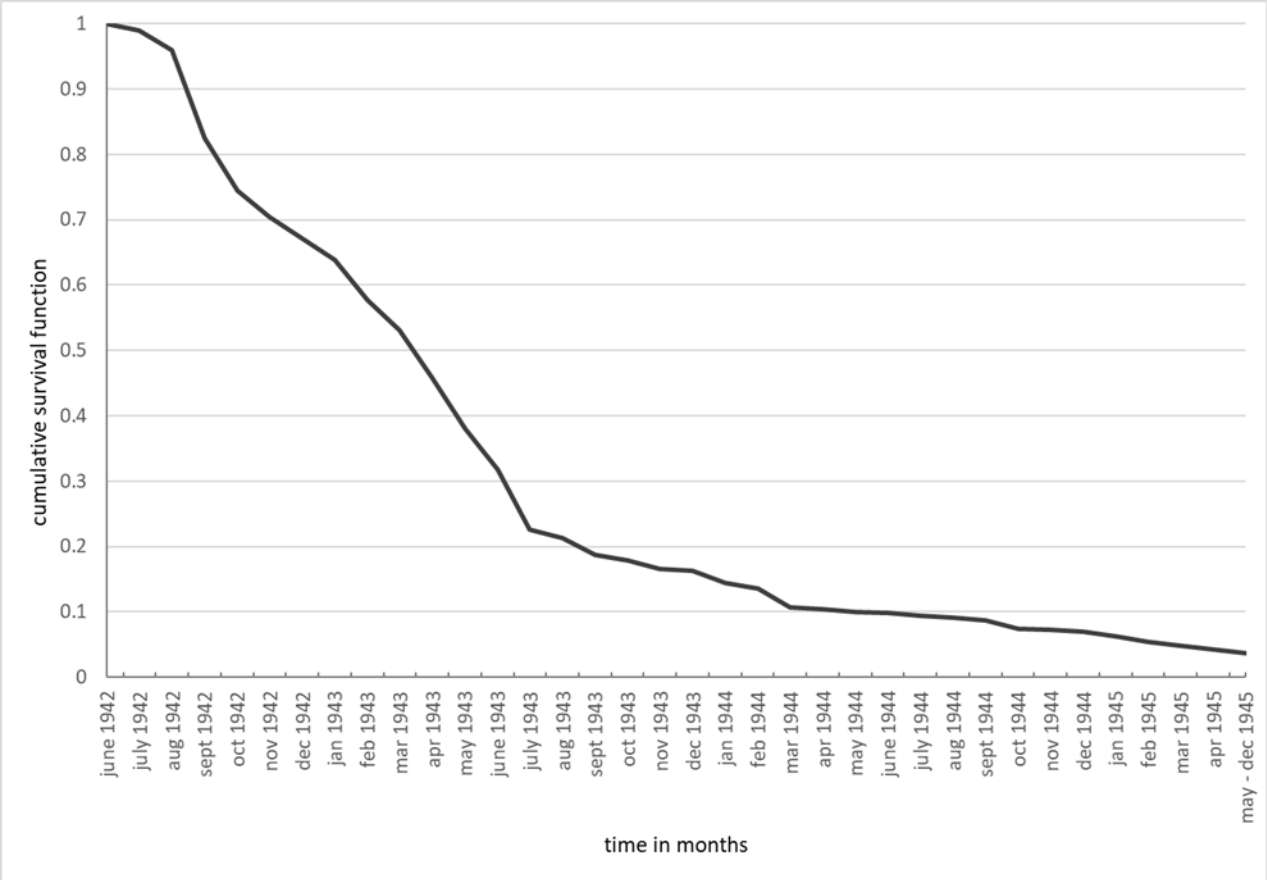
Note: Estimated hazard ratios are from multilevel mixed-effects Weibull regression analyses.

Figure 1.



Adjusted Perpetrator-Victim-Bystander Model Developed by Ehrenreich and Cole.

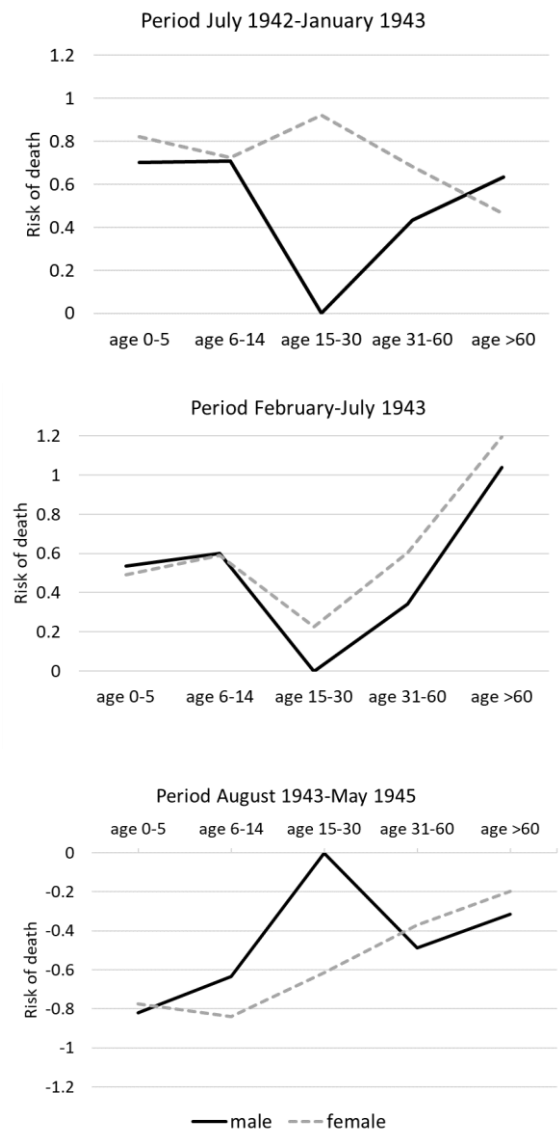
Figure 2.



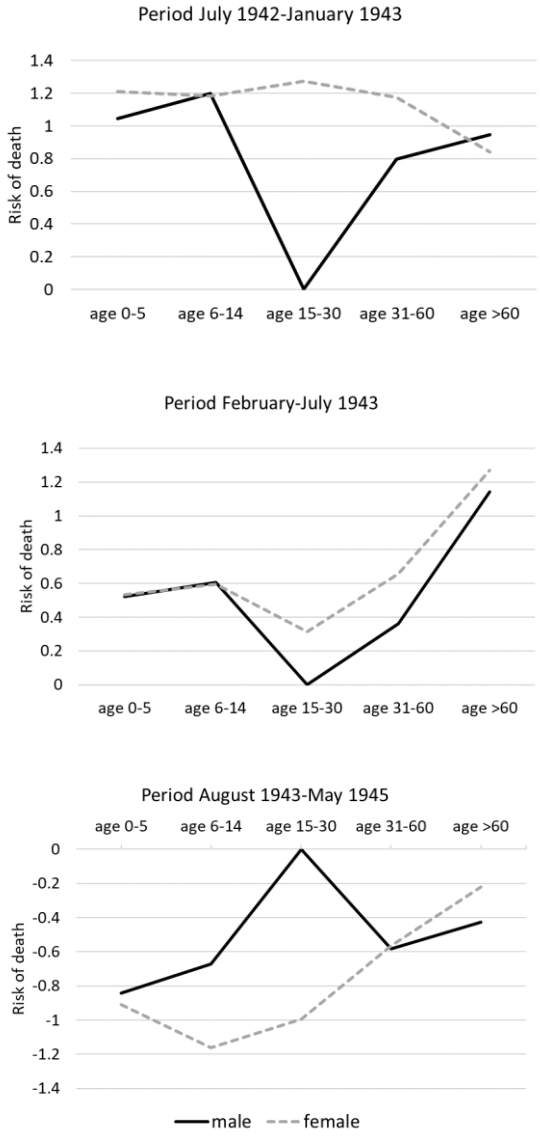
Survival Function of Deported Jews (N=86,292).

Figure 3.

Including Amsterdam (N=86,292)



Excluding Amsterdam (N=28,937)



Risk of Death of Deported Jews According to Age and Gender in Three Time-Periods.
Note: reference category is male aged 15-30.

Appendices Associating Locality-level Characteristics with Surviving the Holocaust

Appendix 1: Lists of Jewish inhabitants living in Dutch municipalities and listings of victims and liberated Jews

MUNICIPAL LISTS OF JEWISH INHABITANTS

After all persons who had one or more Jewish grandparents were ordered by the *Reichskommissar* Seyss-Inquart early 1941 to register themselves in their living places, the *Sicherheitspolizei* ordered burgomasters and their local administrations to produce municipal lists of so-called 'full'Jewish inhabitants; the collaborating head of the Dutch population registry(1, 2) and Dutch historians specialised in the destruction of Dutch Jewry(3-5) believed that practically all Jews complied with the order. A person was considered a 'full' Jew if he/she had at least three grandparents who belonged to an Israelite congregation, or had two Jewish grandparents and was married to a 'full' Jew or belonged to an Israelite congregation. Those 'full' Jews were persecuted by the Nazis; in the article they are referred to as Jews.

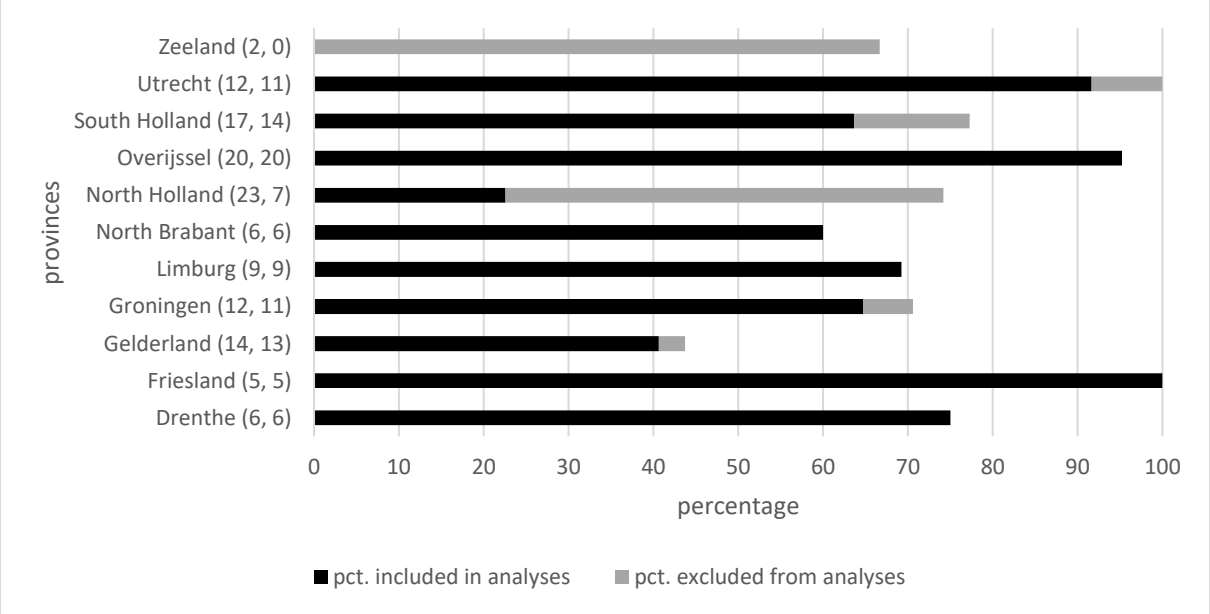
Croes and Tammes retrieved many of those municipal lists in several archives.(6) Others retrieved information about Jewish inhabitants for Arnhem(7) and Eindhoven(8), while civil servants and historians of the local archive reconstructed post-war the Jewish community in Winterswijk. While some lists were made up in spring 1941 because of the Nazi-decree and some others were made up in spring 1942 as part of the preparation of the regular deportations, all these lists were dated before the local start of the regular deportation (Supplementary Table 1). For 126 municipalities having 25 or more Jewish inhabitants the registration lists were retrieved. This is 73% of all Dutch municipalities having 25 or more Jewish inhabitants in counting in total about 87% of all Jews in the Netherlands.

In 19 of these 126 municipality Jews were ordered to leave their homes and to move to Amsterdam in the first half of 1942, before the start of the systematic deportations in July 1942. These 19 municipalities, mainly situated in the province of North Holland were therefore excluded from the analyses. Another 5 municipalities were excluded from the analysis because of missing data on intermarriage among non-Jewish inhabitants (these are Delft, Dordrecht, Hengelo (G), Gorinchem and Zuilen (see Appendix 4). Of the remaining 102 municipalities, half a dozen (Amsterdam(2), Rotterdam, Haarlem, Enschede, The Hague, and Gouda) had less Jewish inhabitant mentioned on the retrieved list than one might expect based on the counting of Inspection of the registry(9), however, these lists seem still appropriate to be used for the aim of this study.(6)

The municipalities for which a registration list was not retrieved were mostly municipalities with smaller Jewish communities. Only Hilversum, Apeldoorn, and Westerbork had over 1,000 Jewish

inhabitants, though Apeldoorn had a Jewish mental hospital and Westerbork a camp for Jewish refugees, while a dozen municipalities had between 100 and 700 Jewish inhabitants and the rest had less than 100 Jewish inhabitants. For nearly all provinces over 60% of the municipalities having 25 or more Jewish inhabitants a registration list was retrieved, except for the province of Gelderland (Supplementary Figure 1). The southern provinces Limburg, North Brabant and Zeeland were for a great part liberated in October 1944, instead of May 1945 as the rest of the Netherlands. However, these provinces are not under- or overrepresented. As mentioned above, only 102 municipalities were included in the analyses due to evacuation of Jewish inhabitants before the start of the regular deportations and missing data for some municipalities. This resulted in a reduction of the number of municipalities to be included in the provinces South Holland, Utrecht, Groningen, Gelderland, and especially North Holland. The province of Zeeland was dropped from the analyses after its 2 municipalities were excluded.

Supplementary Figure 1.



Percentage of Municipal Registration Lists Retrieved for Municipalities Having 25 or more Jewish Inhabitants and the Percentage Used in the Analyses per Province (Numbers Retrieved and Used).

LISTS OF VICTIMS OF THE HOLOCAUST

A listing of all Jews who were deported from the Netherlands and perished without a grave is published in the book *In memoriam-Lezecher* (*IM*)(10) as a means of honouring the memory of those who did not have a proper burial. This memoir contains the names, date and place of birth, and date and place of death of over 101,000 Jews. These data were gathered by the Dutch Red Cross, the Dutch Institute for War Documentation and the Dutch Ministry of Defence and Ministry of Foreign

Affairs, and checked against the population registries. The adjustments published in two addenda in 1997 and in 2000 are included in the digitised version of *IM* used in this study.[1]
Not all Jews who perished during World War II (WWII) are mentioned in *IM* though. Jews who died in the Dutch concentration and transit camps Westerbork and Vught, and those who perished outside a Nazi-camp or who had a grave are not mentioned in *IM*. For this reason, lists of Jews who died in Westerbork or Vught and buried Jews mentioned in other death lists are put in a different victimisation database (WB+), counting in total more than 1,200 Jews. The material was derived from several archives:
-Dutch Red Cross, Information Office, Westerbork Archive, 'jüdische Gemeinde des Kamps Westerbork, Sterberegister' and 'Verzeichnis von verstorbenen jüdischen Lagereinsaszen aus Vught'
- National Archives of the Netherlands, archive no. 2.09.34.01: inv. nos. 28, 36 and 39
- NIOD, Institute for War, Holocaust and Genocide Studies, archive no. 182: inv. no. 36B
- New Israelite Weekly (*Nieuw Israëlitisch Weekblad* (NIW)) 27 (2-3-1965)

Robert Braun provided me with a database containing data extracted from the website Digital Monument to the Jewish Community in the Netherlands (DMJ)[2].(11) DMJ is an Internet monument dedicated to preserving the memory of all those who were persecuted as Jews during the Nazi-occupation of the Netherlands and did not survive. Since its launch in 2005 this website is continuously updated. The DMJ database contains information such as first, last and maiden name, date of birth, and last official place of residence on more than 104,000 Jews, including those who died in Westerbork and Vught and other Dutch locations, as well as recent corrections to *IM*.
The victims mentioned in those databases overlap significantly. However, the databases might also differ slightly in terms of the victims listed, and none of the lists is complete. To minimise underreporting of specific groups of victims, this study used all three databases to determine who among Jews in the Netherlands fell victim to the Holocaust.

LISTS OF JEWS LIBERATED IN CAMPS

Robert Braun provided me a database containing 6,577 Jews who were liberated in concentration and destruction camp abroad and in the Dutch transit camp Westerbork.(11) The material was

[1] See also https://www.dutchjewry.org/phpr/im/in_memoriam/inmemoriam_list.php

[2] See http://www.joodsmonument.nl/?lang=en

derived from the archives of the United States Holocaust Memorial Museum and the Jewish Historical Museum in Amsterdam.

Appendix 2: Matching procedures

MATCHING MUNICIPALITY LISTS OF JEWISH INHABITANTS TO LISTS OF VICTIMS

To compare the Jews mentioned on the 126 retrieved municipality lists to the Jews mentioned in the victimisation databases this study used a deterministic linkage approach by constructing a unique matching key.(12) To this end, only individual characteristics present in both databases can be used. Although Jews in the Netherlands were asked to give their complete first and last name when registering in 1941, it was decided not to use the complete name to avoid mismatching due to possible different spelling or typos. Following up on the matching method developed by Croes and Tammes(6), this study used the first two characters of the first name and the first two characters of the last name. The combination of these two components was not that unique and produces many double matches; to avoid these, the complete date of birth was added. Married women also underwent a matching that included the first two characters of the maiden name instead of the last name. For 340 Jews, it was impossible to construct this matching key due to a missing value on one or several key components. Moreover, 345 Jews appeared twice within a municipal list, and 318 Jews appeared on more than one list probably due to moving; the registration closest to the start of regular deportations was taken. When excluding Jews living in 24 municipalities due to evacuation before the start of the regular deportations or missing data, 121,421 individual records from 102 municipalities were matched using the constructed matching key. The matching procedure is repeated three times, first matching Jews to *IM*, then to WB+ and finally to those mentioned in DMJ.

The non-matched Jews were subjected to a second matching procedure using an alternative matching key. Sometimes the date of birth was not too readable on the registration list, so an alternative matching key was constructed to perform a second matching procedure: first two characters of the first name, first two characters of the last name, and a combination of two of the three date-of-birth components: day, month and year. This resulted in three alternative matching keys for each person, namely the first two characters of the first name, the first two characters of the last name, and respectively day and month, day and year, or month and year. The results of this second matching procedure were checked manually.

MATCHING MUNICIPAL LISTS OF JEWISH INHABITANTS TO LISTS OF RETURNEES

The same approach as above was used to compare Jews mentioned on the retrieved municipality lists to Jews mentioned in the database of Jews liberated in camps. This database was provided to me by Robert Braun and counted 6,577 Jews liberated in camps, including the Dutch transit camp Westerbork.(11) However, for about 4,660 enough information was available to include them in the matching procedure. When matched against the survivors in 102 municipalities in the analyses – those who were not matched to the victimization lists, resulted in 3,180 liberated in a camp and thus had been deported.

Appendix 3: Outcomes 1) chance of deportation to Nazi-camp and 2) risk of death of deported Jews

The focus is on Jews living in the 102 municipalities included in the analyses, excluding Jews who lived in municipalities evacuated before the start of the regular deportations in July 1942 and Jews living in 5 municipalities excluded from the analyses because of missing data on the predictors. This resulted in 119,082 Jews living in 102 municipalities. In the analyses on chance of being deported and risk of death, 103 Jews whose place of birth was unknown and 54 Jews whose gender could not be determined were excluded (see Appendix 4). If we also exclude 683 Jews assumed to have died of natural causes between May 1941 and June 1942 results in 118,242 Jews living in 102 municipalities used in the analyses on chance of being deported.

Supplementary Table 2. The Fate of Jews Living in 102 Dutch Municipalities

	Victimisation	Fate	Deported
1	Died abroad (mostly in camps after being deported)	83,381	83,381
2	Place of death unknown	293	293
3	Died in camps in NL (including suicide)	665	665
4	Killed by Nazi in NL but outside camps (including suicide)	452	
5	Assumed to have died of natural causes July 1942–May 1945	675	
6	Missing	160	160
7	Not reported as having died during WWII	32,616	3,180
8	Total	118,242	87,679

When it is assumed that those (still) reported as missing 70 years after the ending of the WWII were killed by the Nazis (row 6 of Supplementary Table 2), and rows 1 to 4 of Supplementary Table 2 are added, the number of Jews killed by the Nazis is 84,951. This results in a victimization rate of 71.8% ((84,951/118,242)×100); nearly all victims died in Nazi-camps This victimization rate is slightly lower than the Dutch national average of 72.9% calculated by Hirschfeld.(13)

Of the 32,616 survivors (row 7 in Supplementary Table 2), 3,180 were returnees from Nazi-camps. As the total number of deported Jews is 87,679 (Supplementary Table 2, total of last column), then 3.6% survived deportation. The deportation rate is 74.2% ((87,679/118,242)×100). The percentages of Jews deported and killed by the Nazis are given for each municipality in Supplementary Table 1. Supplementary Figure 2 shows the variation in percentages deported and killed among Dutch municipalities.

Supplementary Table 1. The Start of the Systematic Deportations, the Date of the Municipal Registration list, and the Percentages of Jews Deported and Killed by the Nazis for 102 Municipalities.

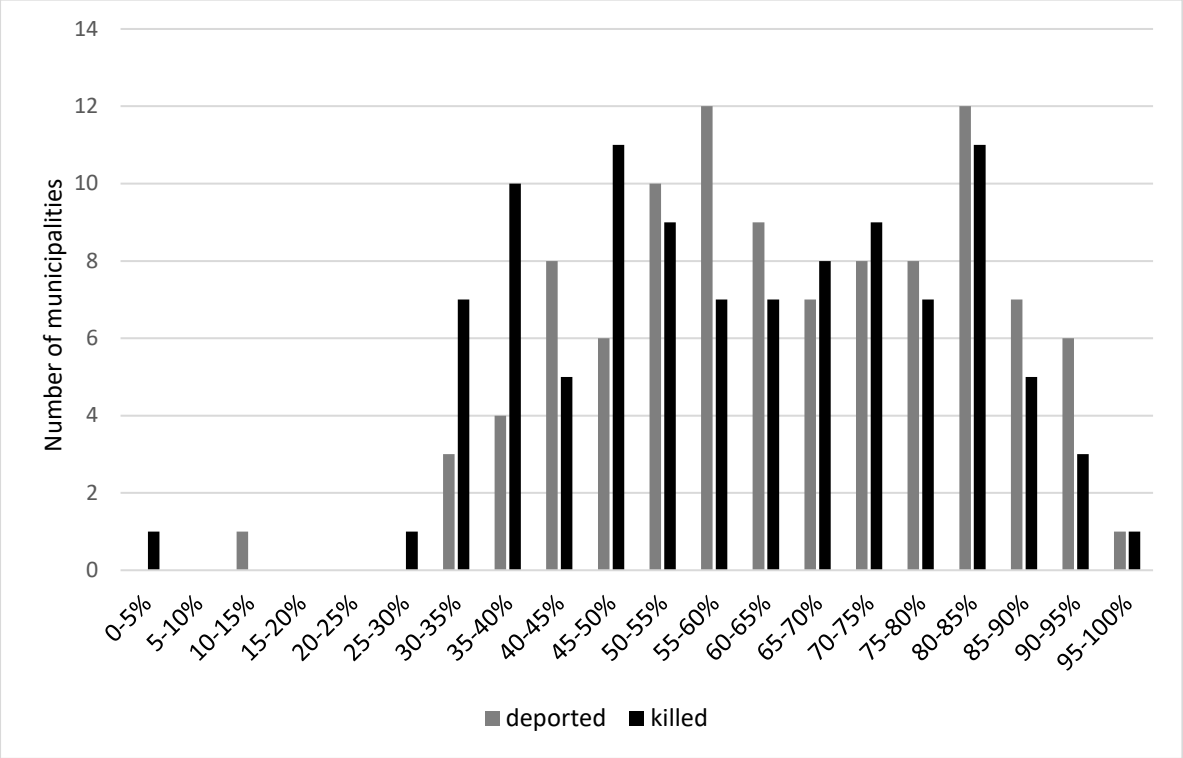
Municipality	Start systematic deportations	Registration list date	number of Jews used in analyses	% of Jews deported	% of Jews killed
Aalten	October 1942	July 1942	78	43.6	42.3
Almelo	September 1942	July 1942	390	59.2	59.5
Alphen aan den Rijn	August 1942	< August 1942	68	85.3	80.9
Amersfoort	August 1942	June 1941	629	56.6	52.6
Amsterdam	July 1942	May 1941	76,130	76.6	74.9
Arnhem	August 1942	October 1941	1,747	64.2	60.3
Assen	October 1942	< October 1942	425	91.1	89.2
Avereest	October 1942	May 1942	45	80.0	80.0
Baarn	August 1942	June 1941	119	47.9	41.2
Beilen	October 1942	< October 1942	57	79.0	77.2
Bergen op Zoom	September 1942	< September 1942	42	54.8	35.7
Bergh	January 1943	July 1942	35	62.9	62.9
Borne	October 1942	July 1942	94	70.2	69.2
Breda	August 1942	July 1942	196	58.2	50.5
Coevorden	September 1942	< September 1942	143	88.8	86.7
De Bilt	September 1942	June 1942	214	52.3	50.0
Den Haag (The Hague)	September 1942	< September 1942	13,097	72.8	70.2
Denekamp	October 1942	July 1942	50	86.0	82.0
Deventer	September 1942	July 1942	587	65.3	61.2
Dinxperlo	October 1942	1941	79	51.9	49.4
Doorn	March 1943	June 1941	70	62.9	55.7
Driebergen-Rijsenburg	August 1942	June 1941	92	41.3	39.1
Ede	April 1943	May 1941	82	47.6	37.8
Eindhoven	September 1942	October 1941	611	49.4	37.6
Emmen	October 1942	< October 1942	173	76.9	74.6
Enschede	September 1942	July 1942	1,205	53.0	47.9
Geleen	August 1942	September 1941	55	65.5	63.6
Gennep	August 1942	< August 1942	38	68.4	60.5
Goor	March 1943	June 1942	30	40.0	33.3
Gouda	August 1942	< August 1942	194	71.1	67.5
Groningen	July 1942	June 1942	2,304	81.0	78.7
Haaksbergen	October 1942	July 1942	53	35.9	34.0
Haarlem	August 1942	August 1942	1,035	57.5	54.5
Hardenberg	February 1943	June 1942	38	92.1	92.1
Haren	November 1942	1941	55	54.6	54.6
Harlingen	September 1942	< September 1942	45	97.8	97.8
Heemstede	September 1942	March 1942	210	43.3	37.6
Heer	August 1942	July 1942	30	80.0	80.0
Heerenveen	August 1942	< August 1942	42	80.1	80.1
Heerlen	August 1942	October 1941	123	60.2	48.0
Hengelo (O)	October 1942	July 1942	300	50.7	49.0

Holten	April 1943	June 1942	52	65.4	67.3
Hoogeveen	October 1942	< October 1942	205	74.6	73.7
Hoogezand	October 1942	1941	88	84.1	83.0
Huizen	February 1943	March 1942	68	55.9	42.7
Hummelo en Keppel	January 1943	July 1942	39	82.1	76.9
Jutphaas	August 1942	June 1941	52	73.1	65.4
Kampen	October 1942	July 1942	39	84.6	84.6
Kerkrade	August 1942	1942	47	61.7	48.9
Leek	July 1942	February 1941	66	87.9	81.8
Leeuwarden	August 1942	< August 1942	604	74.8	73.7
Leiden	August 1942	< August 1942	366	56.8	51.6
Leidschendam	August 1942	< August 1942	26	53.9	53.9
Loosdrecht	August 1942	June 1941	87	43.7	32.2
Maartensdijk	September 1942	June 1941	184	41.3	37.0
Maastricht	August 1942	June 1942	418	62.4	51.9
Meppel	August 1942	July 1942	250	80.8	81.2
Middelharnis	August 1942	May 1942	37	83.8	83.8
Naarden	September 1942	< August 1942	494	50.6	47.4
Nieuwe-Pekela	August 1942	February 1941	29	62.1	58.6
Nieuwer-amstel	September 1942	< September 1942	346	47.7	45.1
Nijkerk	October 1942	July 1942	59	81.4	72.9
Nijmegen	September 1942	1941	516	77.5	73.3
Noordwijk	September 1942	< September 1942	27	63.0	63.0
Oegstgeest	March 1943	May 1942	47	44.7	34.0
Oldenzaal	October 1942	June 1942	59	86.4	84.8
Ommen	October 1942	July 1942	54	68.5	66.7
Oss	September 1942	June 1942	356	73.6	69.4
Oud-Beijerland	August 1942	May 1942	36	77.8	75.0
Oude Pekela	August 1942	March 1941	115	91.3	91.3
Ouder-Amstel	August 1942	March 1942	71	57.8	54.9
Poortugaal	April 1943	1942	27	11.1	3.7
Raalte	September 1942	July 1942	43	86.1	86.1
Rheden	October 1942	July 1942	90	30.0	27.8
Rijssen	October 1942	July 1942	103	90.4	88.6
Roermond	August 1942	July 1942	110	80.9	63.6
Rotterdam	July 1942	< July 1942	5,510	81.0	78.3
Sappemeer	October 1942	February 1941	37	59.5	51.4
Schiedam	August 1942	< August 1942	199	71.9	68.8
Sneek	October 1942	June 1942	42	52.4	50.0
Soest	October 1942	June 1941	71	53.5	42.3
Stad Delden	March 1943	June 1942	27	63.0	55.6
Steenwijk	September 1942	July 1942	93	49.5	47.3
Tiel	November 1942	April 1941	52	38.5	30.8
Tilburg	August 1942	July 1942	325	59.7	37.9
Utrecht	August 1942	June 1941	1,883	59.9	55.3
Vaals	August 1942	< August 1942	49	67.4	59.2
Veendam	September 1942	1941	99	90.9	90.9
Venlo	August 1942	July 1942	143	57.9	46.2
Vlagtwedde	September 1942	February 1941	108	84.3	79.6
Voorburg	August 1942	< August 1942	368	45.7	44.0
Waalwijk	August 1942	June 1942	25	44.0	36.0
Wassenaar	August 1942	< August 1942	119	42.0	38.7
Wierden	October 1942	July 1942	49	59.2	55.1
Wildervank	August 1942	July 1942	122	85.3	81.2
Winschoten	August 1942	July 1942	392	91.2	89.1
Winterswijk	September 1942	1942*	250	82.4	81.2
Wisch	April 1943	March 1941	64	34.4	32.8
Woerden	April 1943	May 1942	41	34.2	34.2
Zeist	August 1942	June 1941	223	39.0	35.9
Zutphen	October 1942	April 1941	483	77.4	73.7

Zwolle	October 1942	July 1942	658	68.8	66.9
Overall			118,242	74.2	71.8

*post-war reconstruction of Jews living in Winterswijk in 1941 and 1942 before the start of the deportations.

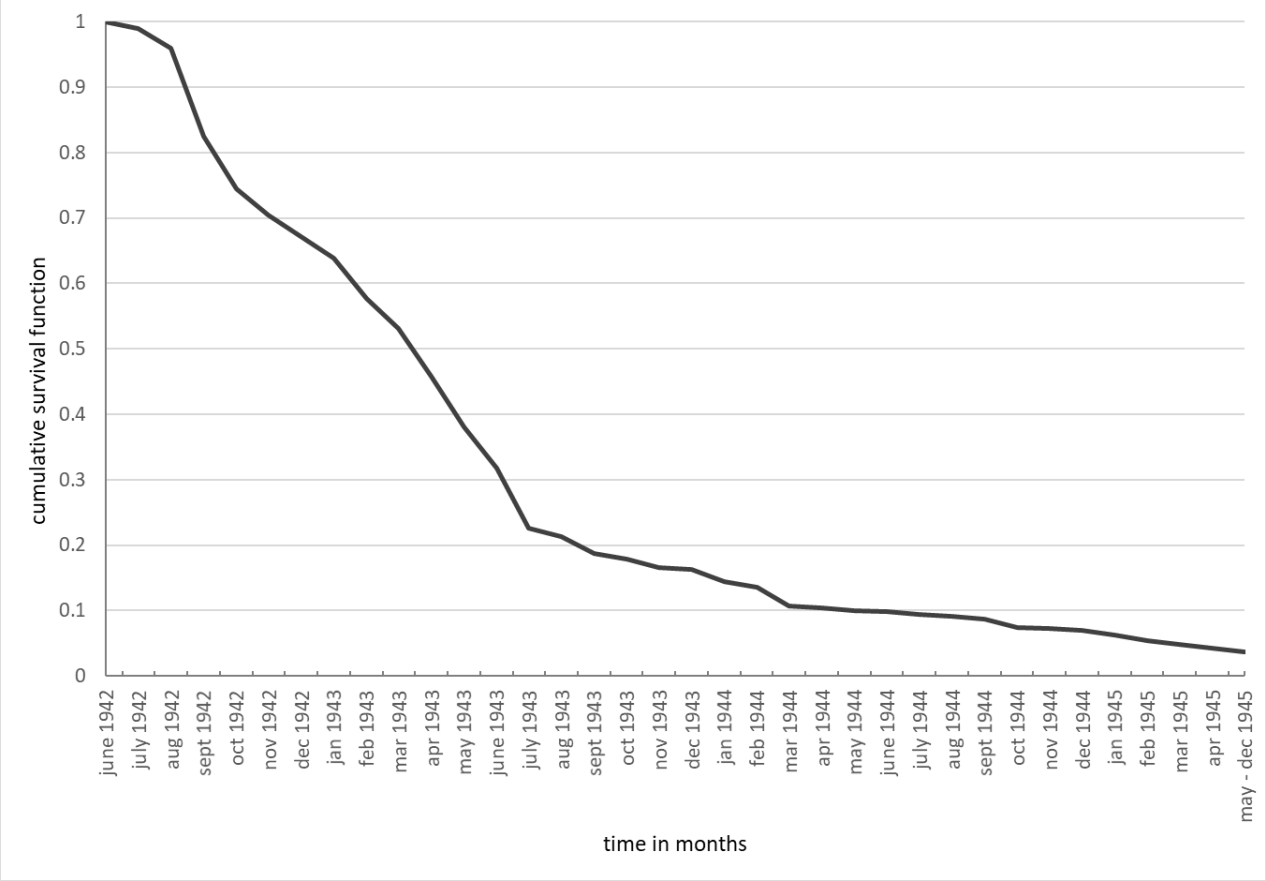
Supplementary Figure 2.



Distribution of 102 Dutch Municipalities Regarding the Local Percentages of Jews Deported and Jews Killed During the Holocaust.

To study the risk of death of deported Jews, the study used the date of death given in the victimisation lists. For 160 Jews whose status is 'missing' no date of death is given, while for another 301 Jews who perished only year of death was given. These Jews were left out of the analyses on risk of death. Besides, to reduce immortality-time bias(14) in this analysis, excluded from the analysis were also those deported and/or killed by Nazis before July 1942 as many were not in danger to be deported before that time; in total 926 Jews, resulting in 86,292 Jews included in this analysis. Furthermore, 160 Jews died between June and December 1945. Although Nazi-Germany surrendered in May 1945, their death is assumed to be Holocaust related. Supplementary Figure 3 shows the cumulative survival rate for these Jews.

Supplementary Figure 3.



Survival Function of deported Jews (N=86,292).

Appendix 4: Exposures and covariates

INDIVIDUAL LEVEL: SOCIO-DEMOGRAPHIC CHARACTERISTICS

Based on the first name and maiden name for married women given on the municipal registration lists a person's gender was determined. For 54 Jews with a complete matching key their gender could not be determined and were excluded from the analyses.

Using the given date of birth, the age at June 1942 was determined. Jewish children under age 6 did not need to wear a yellow Star of David. Jewish children aged 6-14 did not need to have the identity card introduced in July 1941 for all Dutch citizen 15 or older and marked with a big black 'J' for Jews in January 1942.(3) Next, adult Jews were split into three categories as especially younger (male)

adults might be selected for work in camps which might impact surviving Nazi-camps. The following age categories were distinguished: 0-5, 6-14, 15-30, 31-60, and 61 and over.

To determine one's migrant status, place of birth was used. The place of birth showed who was born abroad and who was born the Netherlands; for 103 Jews their place of birth was not given or unclear and were excluded from the analyses.

Jews married to a non-Jew were exempted from deportations, though still at risk if they did not comply with the many anti-Jewish regulations introduced during the German-Nazi occupation, while Nazi-policy changed during the occupation.(4, 15) On about two-third of the registration list it was given who was married to a Gentile. As non-Jews were not included on the Amsterdam registration list, married Jews living at an address where only one married person was listed were coded as having a non-Jewish spouse, although some Jewish spouses may have been temporarily living elsewhere. To determine who was married to a Gentile in the other municipalities a list of mixed married Jews made up in September and November 1942 were used; Robert Braun provided me scans of these lists.(11)

Jews who were converted to Christianity were initially exempted from deportation though Nazi-policy changed during the occupation.(4) List of Jews who were converted to Christianity made up in September and October 1942, archived at NIOD, Institute for War, Holocaust and Genocide Studies, were used to determine who on the municipal registration lists were converted to Christianity. In Supplementary Table 3 the number and percentages of individual socio-demographic characteristics are given for both analyses.

Supplementary Table 3. Descriptive Statistics of the Population, Jews in 102 Dutch Municipalities 1941-2.

		Chance of Deportation		**Risk of death deported Jews**	
	Variable	**N**	**%**	N	%
Deported	Deported/killed	87,679	74.15	83,112	96.31
	Not deported/Survived	30,563	25.85	3,180	3.69
Gender	Male	57,422	48.56	41,591	48.20
	Female	60,820	51.44	44,701	51.80
Age	0-5	5,633	4.76	3,877	4.49
	6-14	11,241	9.51	8,743	10.13
	15-30	27,801	23.51	19,198	22.25
	31-60	54,702	46.26	39,740	46.05
	>60	18,865	15.95	14,734	17.07
Immigrant	Born in Netherlands	98,239	83.08	73,694	85.40
	Born abroad	20,003	16.92	12,598	14.60
Religion	Converted Jews	1,264	1.07	420	0.49
	Not converted to Christianity	116,978	98.93	85,872	99.51
Intermarriages	Married to a non-Jew	8,541	7.22	3,128	3.62
	Not married to a non-Jew	109,701	92.78	83,164	96.38
	Total	118,242	100	86,292	100

MUNICIPAL LEVEL: PERPETRATORS

Sicherheitspolizei (SiPo) [Security Police] districts and distance between living place and *SiPo*-offices

After Nazi-Germany invaded the Netherlands in May 1940, it was divided into *SiPo*-districts. The *SiPo* head quarter was in The Hague while the Netherlands was divided into 6 regional *SiPo*-districts (*Außenstellen*): Amsterdam (comprising the provinces North Holland and Utrecht), Rotterdam (comprising the province South Holland except for The Hague), Groningen (comprising the provinces Drenthe, Friesland and Groningen), Arnhem (comprising the provinces Gelderland and Overijssel), Den Bosch (comprising the provinces North Brabant and Zeeland), and Maastricht (comprising the province Limburg). Each of these districts had its own head office, while some districts had additional offices: Utrecht (*SiPo*-district Amsterdam), Assen (*SiPo*-district Groningen), Eindhoven (*SiPo*-district Den Bosch), Enschede (*SiPo*-district Arnhem), and Delfzijl (*SiPo*-district Groningen) totaling 12 *SiPo*-offices in the Netherlands.(16) For each municipality, the distance in kilometers as the crow flies to the nearest *SiPo*-office of additional post within its *SiPo*-district was calculated.[3] The distances provide an indication which municipalities were closer and which ones were more remote from *SiPo*-offices. Some of the municipalities had a *SiPo*-office in their town while some other municipalities were quite remote from such a post. The median and the interquartile range of the distance to a *SiPo*-office for the 102 municipalities included in the analyses are given in Supplementary Table 4.

Local round-ups before July 1942

Using Presser(4) (1965), Michman et al.(17), and some local studies we determined that Jews in 15 of 102 municipalities in the analyses experienced (small) round-ups (mostly targeted to capture certain young adult men) in 1941 and in 1942 before the start of the regular deportations: Aalten (October 1941), Amsterdam (February and June 1941), Arnhem (September 1941), Denekamp (September 1941), Enschede (September 1941), Hengelo (province of Overijssel; September 1941), Keppel (October 41), Leeuwarden (April 1942), Oldenzaal (September 1941), Rheden (October 1941), Schiedam (December 1941), The Hague (September 1941), Winterswijk (October 1941), Zutphen

[3] https://nl.distance.to/ was used to calculate those distances.

(October 1941), and Zwolle (October 1941). To control for round-ups taken place before the start of the systematic regular deportations a binary variable has been introduced in the analysis.

Start of systematic deportation of local Jews

The first of a total of 103 deportation trains left the Dutch transit camp Westerbork on 15 July 1942. However, not in every municipality Jews were deported at the same time. Using Michman et al.(17), Presser(4), and some local studies in combination with the dates of death of Jewish inhabitants murdered in Nazi-camps after June 1942 the study determined for each municipality in the analysis the year and month Jews had to leave their homes as a result of the systematic deportations. In some municipalities Jews were ordered to leave their homes in July 1942 such as in Amsterdam while in other municipalities Jews could stay in their home till April 1943 such as in Wisch (Supplementary Table 1).

Supplementary Table 4. Descriptive Statistics of Characteristics of 102 Dutch Municipalities.

	N	Pct.
Situated in SiPo-district		
Amsterdam	18	17.7
The Hague	3	2.9
Rotterdam	12	11.8
Arnhem	33	32.3
Groningen	21	20.6
Den Bosch	6	5.9
Maastricht	9	8.8
Round ups before July 1942		
No	87	85.3
Yes	15	14.7
Jews sent to NL Labor camps		
No	70	68.6
Yes	32	31.4
Start systematic deportations		
July 1942	4	3.9
August 1942	38	37.2
September 1942	21	20.6
October 1942	24	23.5
November 1942	2	2.0
January – April 1943	13	12.8
National Socialist (NSB) Burgomaster		
Appointed before July 1942	24	23.5
Appointed after June 1942	35	34.3
No NSB burgomaster appointed	43	42.2
Homogeneous religiously marrying: Cohen's kappa, quartiles		
Q1: Lowest values (<0.823)	26	25.5
Q2 (>0.822-<0.882)	25	24.5
Q3 (>0.881-<0.917)	26	25.5
Q4: highest values (>0.916)	25	24.5
Print of resistance (news)papers per adult population		
No resistance papers printed	45	44.1
<3 newspapers per 10,000	28	27.5
3+ newspapers per 10,000	29	28.4
Religious fragmentation: Rae & Taylor formula, quartiles		
Q1: least fragmented (<0.453)	26	25.5
Q2 (>0.453-<0.617)	25	24.5
Q3(>0.616-<0.706)	26	25.5
Q4: most fragmented (>0.705)	25	24.5
	Median	IQ*
Distance as the crow flies in km to SiPo office within SiPo district	20.9	11.5-33.6
Proportion of local policemen fired post-WWII because of collaboration	0.09	0-0.17
Pct. of local votes for NSB during the elections for the Provincial Estates in 1939	4.2	3.2-5.9
Pct. of Catholics	22.8	10.7-48.9
Pct. of 'quarter' and 'half' Jews of total number of 'full' Jews	16.3	5.4-27.8
Number of Jews per 1,000 adult non-Jews	14.2	8.7-25.1
Pct. employed in agriculture	16.0	4.0-41.0
Population density per 100 inhabitants per km2	5.0	2.4-15.0

* Interquartile range

MUNICIPAL LEVEL: INVOLVEMENT OF NON-VICTIMS/NON-PERPETRATORS IN DESTRUCTION PROCESS

The appointment of a national-socialist burgomaster

The names of burgomasters in Dutch municipalities during occupation years 1940-1945 were found in the *Official Dutch Gazette*, the *Dutch State-directory*, *Pyttersen's Dutch State-directory* and the *Official directory for the Occupied Dutch Territory*. During the Nazi-occupation some pre-war appointed burgomasters were replaced by order of the Nazis.(18) To determine where and when a pre-war appointed burgomaster was replaced, this study made use of monthly reports made by *Oberbürgemeister* Althaus *über die Tätigkeit der Abteilung für Niederländische Personalangelegenheiten* archived at NIOD, Institute for War, Holocaust and Genocide Studies (Generalkommissar für Verwaltung und Justiz, inv. no. 94). All names of pre-war and during the occupation years appointed burgomasters of the municipalities in this study were checked against post-war purge files to determine which burgomaster was a member of the *Nationaal Socialistische Beweging (NSB)* [National Socialist Movement].(16) These purge files are archived at the National Archive (Zuivering van ambtenaren en de Nederlandse Ridderorde, zuiveringsdossiers). Based on the information from these files, in 24 municipalities a NSB-burgomaster was appointed before July 1942, the start of the systematic regular deportations. Although that is about 23% of all municipalities, it's about 85% of all Jews in the analyses. In 35 municipalities, a NSB-burgomaster was appointed between July 1942 and September 1944, comprising about 9% of the Jews in the analyses; 43 municipalities had not had a NSB-burgomaster, these are mostly smaller places comprising about 6% of all Jews in the analyses.

The percentage of collaborating policemen in the local police force

For each municipality, the number of lower ranked policemen - that is a rank lower than police officer- fired after the liberation because of their attitude and conduct during the occupation was determined using post-war purge files. Policemen were fired when they for instance were a member of the NSB or had collaborated heavily. These purges of the police force were centrally led by the Ministry of Justice to avoid local or personal animosity. These purge files are archived at the National Archive (Bureau Juridische Zaken, Zuivering van de afdeling politie en taakvoorganger (1941-) 1944-1965 (1983), inv. nos. 97-103). The number of lower ranked policemen in a municipality in February 1944 was used to calculate the percentage of collaborating lower ranked policemen.(16) This overview of the local police forces is archived at the National Archive (Militair gezag, (1939) 1943-1947 (1956), inv. no.1477).

MUNICIPALITY-LEVEL: BYSTANDERS FACILITATING DESTRUCTION PROCESS

Level of Anti-Semitism

To measure the locality-level of Anti-Semitism the local electoral support for the *Nationaal Socialistische Beweging (NSB)* [National Socialist Movement] was taken: percentage of NSB-voters. The NSB became more anti-Semitic in the second half of the 1930s. Local election results for the Provincial Estates in April 1939, one year before Nazi-Germany invaded the Netherlands, were retrieved from the archives of Statistics Netherlands.(19)

Level of anti-Judaism

Among Christians religious anti-Jewish sentiments were prominent, especially among Catholics.(20) To measure the locality-level of anti-Jewish sentiments, the local percentages Catholics was taken. The pre-war information on religious composition of municipalities closest to the occupation years was the 1930 census.(21)

Separation mentality as a result of vertical pluralism: degree of inter-religious marriage among non-Jewish inhabitants

To measure local segregation mentality due to vertical pluralism(22), this study focused on the degree of inter-religious marriage using Cohen's kappa(23). As Cohen's kappa measures the agreement between two raters who each classify N items into C mutually exclusive categories, it can be applied to adults agreeing on spouses to have or have not the same religious affiliation. As Cohen's kappa measure takes into account the possibility of inter-religious marrying (the agreement occurring) by chance it provides an indication to what degree inter-religious marrying took place more/less often than just by chance.

Little data is available regarding who had married whom at the municipal-level before WWII. To be able to construct marriage tables regarding the religious affiliation of spouses this study used individual data from the 1960 census archived at Data Archiving and Network Services (DANS). For each married man their date of marriage, his and his wife's religious affiliation, and date of settlement in the living place is available. Of all men living in 1960 in these municipalities, only those

who lived there before 1945 and were married before 1945 were selected; that is on average about 42% of all married men.

As people died, moved or divorced between 1945 and 1960, using the 1960 census might result in two types of biases. Firstly, a sample bias; couples married at the beginning of the 20th century or at the end of the 19th century were more likely to belong to the same religious affiliation than couples married in the 1920s and 1930s.(24) Many of those older couples might not be alive anymore in 1960 resulting in an overestimation of inter-religious married couples during the occupation years. Secondly, a selection bias; inter-religious married couples might have had a preference to move to places with weaker social differentiation between 1945 and 1960 and couples with a homogeneous religious marriage might have had a preference to move to places with stronger social differentiation, resulting respectively in an underestimation of inter-religious marriages in municipalities with weaker social differentiation and an overestimation of inter-religious marriages in municipalities with stronger social differentiation.

Supplementary Table 5. The Percentages of Homogeneous Religiously Married for 11 Dutch Provinces and 6 Cities, Based on Data From the 1960 Census and Annual Marriage Statistics.

	Marriage tables 1938-1944		**1960 census: < 1945**	
	Provinces	Provinces* and cities	Provinces	Provinces* and cities
Limburg	0,964	0,964	0,981	0,981
North Brabant	0,957	0,957	0,978	0,978
Drenthe	0,839	0,839	0,958	0,958
Overijssel	0,844	0,844	0,949	0,949
Gelderland	0,860	0,860	0,946	0,946
Groningen	0,850	0,875	0,939	0,947
Zeeland	0,815	0,815	0,928	0,928
Friesland	0,821	0,821	0,926	0,926
Utrecht	0,738	0,779	0,905	0,930
South Holland	0,692	0,761	0,883	0,930
North Holland	0,630	0,749	0,865	0,880
Amsterdam		0,533		0,852
The Hague		0,686		0,866
City of Groningen		0,794		0,918
Haarlem		0,713		0,863
Rotterdam		0,569		0,852
City of Utrecht		0,670		0,871

*Province Groningen without the city of Groningen, the province North Holland without Amsterdam and Haarlem, the province Utrecht without the city of Utrecht, the province South Holland without The Hague and Rotterdam.

For 6 cities (Amsterdam, The Hague, Haarlem, Groningen, Rotterdam and Utrecht) and 11 provinces annual marriage tables regarding the religious affiliation of spouses are available over the years 1938-1944. To determine whether men had the same religious affiliation as their wives, religious affiliation was categorized into five categories: Catholic, Dutch reformed, Orthodox reformed, other denominations, and religiously unaffiliated. To get an impression of the appropriateness of the 1960 census data, the percentage of homogeneous religiously married men for those 17 geographical areas were calculated using both the census data and the marriage statistics for the year 1938-1944 (see Supplementary Table 5) and next the rankings of those 17 geographical areas were compared.(16) The Spearman and the Pearson correlation based on calculations for the eleven provinces only is 0.91 ($p<0.001$) and 0.98 ($p<0.001$), respectively. These correlation are 0.93 ($p<0.001$) and 0.94 ($p<0.001$), respectively, when based on the eleven provinces and the six cities. These results show very high correlations between the rankings of the provinces and cities and indicate a similar ranking of those geographical areas. Since the ranking of those geographical areas is similar for both sources it seems appropriate to use data derived from the 1960 census for this study. Based on 1960 census data, the Cohen's kappa measure regarding inter-religious marrying was calculated for each municipality in this study.

MUNICIPALITY LEVEL: BYSTANDERS SUPPORTING JEWS IN HIDING OR ESCAPING NAZI-PERSECUTION

The relative number of 'half' and 'quarter' Jews

Jews born from Jews-Gentile marriages could be bridges between Jews and non-Jews. If there are relative more 'half' and 'quarter' Jews, this might indicate more bridges between Jews and non-Jews. To determine the relative number 'half' and 'quarter' Jews, a municipal overview of the number of 'full', 'half', and 'quarter' Jews made up by the Inspection of the registry was used.(9)

Degree of resistance

To get an indication about the degree or level of resistance in a municipality, this study used as a proxy the number of locally printed resistance newspapers.[4] Using the number of locally printed resistance newspapers and the local number of the voting-eligible population for the Provincial

[4] Using information from the website: https://nl.wikipedia.org/wiki/Lijst_van_verzetsbladen_uit_de_Tweede_Wereldoorlog.

Estates in April 1939(19) allowed us to determine the number of locally printed resistance newspapers per 10,000 adults.

Religious diversity

Braun concluded that religious fragmented municipalities were more willing to assist Jews to escape persecution.(11) Following Rae and Taylor(25), this study calculated for each municipality the degree of religious fragmentation using the number of Catholics, Dutch reformed, Orthodox reformed, other denominations, and religiously unaffiliated in a municipality using the 1930 census.(21) A higher fragmentation score indicates a more religious diverse municipality.

Religious diverse or fragmented municipalities do not have to result in having relatively more religious heterogeneous marriages. That depends on the degree of the mentality to live segregated or separated (according to denominational lines). The calculated degree of non-Jews in religiously homogeneous marriages captured this mentality as members from different denominational groups are less likely to marry each other when segregation mentality is stronger. This results for example in about 20% of municipalities being religiously fragmented and having a stronger mentality to live segregated (Supplementary Table 6, quartiles 3 & 4). As both variables, religious fragmentation and segregation mentality, are only weakly related (r=-0.137, p=0,168, n=102) and both measure something else one can hypothesize difference in impact and include both variables in the analytical model.

Supplementary Table 6. Cross tabulation of a municipality's religious fragmentation score and the degree of segregation mentality.

	Segregation mentality: degree of homogeneous religiously married non-Jews (Cohen's Kappa scores, quartiles))				
Religious fragmentation (Rae & Taylor scores, quartiles)	1 (weak)	2	3	4 (strong)	Total
1 (less fragmented)	13	2	5	6	26
2	2	4	6	13	25
3	1	9	10	6	26
4 (more fragmented)	10	10	5	0	25
Total	26	25	26	25	102

MUNICIPALITY LEVEL: CONTEXT

Agricultural activity

Many Jews hid in or around farms. More local farms in a municipality increased a Jew's opportunity to find a hiding place and thereby to escape persecution. As a proxy, this study used the percentage of the local population occupied in the agricultural sector using the 1930 census.(21)

Population density

A higher population density in a village or town might have reduced the chance to find a hiding place while it also might have increased the risk for Jews in hiding of being betrayed. The local population density in km^2 was taken from the Statistics Netherlands publication on population density in 1939.(26)

Number of Jews per 1,000 adult non-Jews

Using the voting-eligible population for the Provincial Estates in April 1939 provided the local number of local adults.(19) This number was reduced by the number of adult Jews to determine the number of local non-Jewish adults. Using this information, it was possible to determine the number of Jews per 1,000 non-Jewish adults. A lower number of Jews per 1,000 non-Jewish adults might indicate more potential helpers per Jews. It could also indicate that such a place was of less interest to the Nazi-occupiers in the process of persecution of Jews.

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